Quantificational Meaning of Bare NPs in Korean and Japanese

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1. Introduction

The question of how to adequately analyze the quantified meaning of bare NPs in a thoery of formal semantics has been attempted in Carlson (1977, 1979) and Lawler (1972, 1973). However, it is very difficult to distinguish whether bare NPs express existential or universal readings because they do not contain a transparent quantifier.

Carlson (1977, 1979) claims that bare NPs cannot be analyzed as quantified NPs in themselves but that the verb phrase, based on its characteristics, determines whether the bare NP has an existential reading or a universal reading.

(1) a. Dogs have ears.
b. Dogs run into the house.

(la) has a universal reading since no dog does not have ears in the actual world, that is, all dogs have ears. On the other hand, (lb) has an existential reading; it states an event that some dogs run into the house. Thus the same bare NP dogs in (l) has quite different quantified readings: universal and existential reading.

Carlson (1979) regards the set of entities as consisting of three disjoint subdomains in analyzing the quantified meaning of bare NPs, based on the predicates. These subdomains are labelled *stages, objects,* and *kinds. Objects* are thought of as constituting entities, or as corresponding to the set of possible individuals. *Stages* are time-space slices of individuals. The subdomain of *kinds* are likewise regarded as constituted of individuals—these individuals being possible kinds of things.

His distinction in subtyping the predicates is as follows:

(2)	*Objects*	*Stages*	*Kinds*
	know how to dance	run into the room	be extinct

have ears	found a match	be widespread
(be) intelligent	ate a donut	be common
can read a book	be sick	

The predicates in the stage group select the existential reading of the bare NP. This is the result of applying to the bare NP a predicate which makes a claim about *stages* and also indicates the temporal notion of the subject. On the other hand, the predicates in the object group select the universal reading of the bare NP, and also indicate the permanent notion of the subject.

In the same fashion, Lawler (1972, 1973) analyzes the quantified meanings of bare NPs by the predicate.

(3) Dogs run

(4) a. On all occasions when dogs go, they run.
b. There have been existing occasions of dogs running.

Sentence in (3) is ambiguous, with an existential reading having the meaning of (4b) and a universal reading having the meaning of (4a).

In this paper I will provide some arguments that Carlson's and Lawler's analyses are not adequate for the quantified meaning of bare NPs. I will also demonstrate a new device which is modeled after the revised and extended version of Cooper's model theory (1983).

II. Some Problems in Previous Analyses of Bare NPs

Analyses by Carlson (1977, 1979) raise several problems. First, there is not sufficient evidence to subcategorize entities into three categories. Consider the following examples:

(5) a. Cats are wild
b. Farmers are diligent.
c. Leaves fall.

If the predicate *(be) wild* in (5a) or *(be) diligent* in (5b) applies to the objects of entities, both of the sentences (5a) and (5b) should be interpreted as having universal readings. However, some cats are believed to be tame and some farmers to be lazy. If (5c) states the occasions of falling leaves, then it will have an existential reading, because the predicate *fall* applies to the stages of entities. On the other hand, if (5c) states the properties of all leaves falling, then it will have a universal or generic reading. Therefore.

justification is not provided for the subclassification of entities.

Second, there is confusion in deciding the quantified meaning of bare NPs.

(6) a. Lions have ears.
b. All lions have ears.

Both of the sentences in (6) have a universal reading. However there are two different triggers which decide the universal reading of the sentences. In (6a) the predicate *have ears* triggers the universal quantified meaning of the bare NP, because the predicate applies to objects of entities. On the other hand, in (6b) the transparent quantifier *all* triggers a universal reading. That is, there are two kinds of triggers which decide quantified meaning in (6b).

Third, sometimes predicates do not trigger the quantified meaning of the bare NP.

(7) a. Flags sometimes have stripes on them.
b. Flags always have stripes on them.

Both of the sentences in (7) consist of the same constituents with only the adverb being different. According to Carlson, the predicate *have stripes on them* in (7) triggers a universal reading of the bare NP *flags* because *have + NP* structure applies to objects of entities. However, (7a) has an existential reading, and (7b) has a universal reading.

Levise (1975) points out that the adverb decides the quantified meaning of bare NPs. Because the adverb functions as a quantifier itself, (7a) can be rewritten as (8a) and (7b) as (8b).

(8) a. Some flags have stripes on them.
b. All flags have stripes on them.

The adverb *sometimes* is realized as an existential quantifier *some* in (8b), and *always* as the universal quantifier *all* in (8b). Thus the predicate does not effect the quantified meaning of the bare NPs.

To solve such problems I provide a device which is modeled after Cooper grammar.

III. An Extension of the Simple Fragment

Cooper grammar consists of syntax and semantics. The syntax is adapted from the well-known transformational grammar. The semantics, based

on the model theoretic semantics in Cooper (1975, 1979, 1980, 1982) and Cooper and Parson (1976), is model theoretic objects, he calls, which is a revised version of generalized quantifiers in Barwise and Cooper (1981). The syntax of Cooper grammar consists of a lexicon and phrase structure. Semantics is defined as, not a function from phrases to meanings, but a relation between two sets, the set of phrases and the set of meanings because natural languages are ambiguous.

Now in order to analyze bare NPs by bare NPs themselves, not by the predicates, consider the following:

(9) a. Dogs run.
b. *Dog runs.

Bare NPs should be distinguished from simple common nouns. The common noun *dog* in (9b) does not have the function of an NP as a subject or object, but the bare NP *dogs* in (9a) works as a full NP. Syntactically bare NPs consist of a noun plus the morpheme {-s{. In this case, the morpheme {-s} can be analyzed as a function taking the common noun *dog* in (9a) as its argument just as *every* in *every boy*, for instance, takes *boy* as its argument. In other words, the morpheme {-s} and the determiner *every* have the same semantic function as a quantifier.

However, the morpheme {-s} is considered to consist of the homonyms $\{\text{-s}_1\}$ and $\{\text{-s}_2\}$. The morpheme $\{\text{-s}_1\}$ is considered to function the same as the universal quantifier *every* semantically, and the morpheme $\{\text{-s}_2\}$ as the existential quantifier *some* or *a*. The meaning of (9a), having a universal reading and an existential reading, depends on the morpheme, that is, when the morpheme $\{\text{-s}_1\}$ is attached to the common noun *dog* in (9a), the bare NP *dogs* has a universal reading, and when morpheme $\{\text{-s}_2\}$ is attached to the common noun *dog* in (9a), it has an existential reading. Thus the quantified meaning of a bare NP depends on the morpheme {-s} which is a functor expression mapping a common noun to a bare NP syntactically, and mapping the denotation of the common noun to that of the bare NP semantically.

To formulate the syntactic and semantic rules of bare NPs, it is necessary to postulate the syntactic categories and semantic representations. What I have provided in (10) is a set of revised syntactic categories and syntactic rules, and in (11) a set of revised denotations of basic expressions and semantic rules for bare NPs.

(10) a. Lexicon
N: dog
PL: $\{\text{-s}_1\}$, $\{\text{-s}_2\}$
VP: run

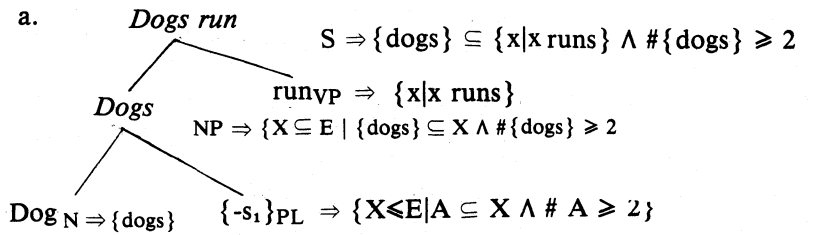
b. Phrase structure
S → NP VP
NP → N PL

(11) a. Lexicon
N, VP — If α is listed under N or VP, then $[\![\alpha]\!] = @ \mapsto f$ such that for any $\omega \in W$, $f(\omega) \subseteq W$
PL — If α is i) $\{\text{-s}_1\}$ ii) $\{\text{-s}_2\}$, then $[\![\alpha]\!] = @ \mapsto f$ such that for any $\omega \in W$ and $A \subseteq E$
i) $f(\omega)(A) = \{X \subseteq E \mid A \subseteq X \wedge \#A \geq 2\}$
ii) $f(\omega)(A) = \{X \subseteq E \mid X \cap A \neq \emptyset\}$

b. Phrase structure
$[\![\text{NP VP}]_S]\!] \rightarrow \sigma \mapsto (\omega \mapsto K\,[(\text{NP}^{\sigma,\omega}_{\sigma,\omega})\,(\text{VP}^{\sigma,\omega}_{\sigma,\omega})])$
$[\![\text{N PL}]_{NP}]\!] \rightarrow \sigma \mapsto (\omega \mapsto \rho_{\text{-PL}}\,(\text{N}^{\sigma,\omega}_{\sigma,\omega}\,(\text{PL}^{\sigma,\omega}_{\sigma,\omega}))$

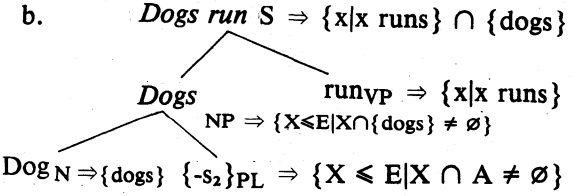
Accroding to the extended version of Cooper grammar, the quantified meaning of (9) can be analyzed as shown in (12).

(12) a.



$[\![s]\!] \rightarrow \sigma \rightarrow (\omega \rightarrow K\,[(\text{NP}^{\sigma,\omega}_{\sigma,\omega})\,(\text{VP}^{\sigma,\omega}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\,[(\rho_{\text{-PL}}\,(\text{N}^{\sigma,\omega}_{\sigma,\omega}\,(\text{PL}^{\sigma,\omega}_{\sigma,\omega}))\,(\text{VP}^{\sigma,\omega}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\,[(\rho_{\text{-PL}}\,(\text{dog}^{\sigma,\omega}_{\sigma,\omega}\,(\{\text{-s}_1\}^{\sigma,\omega}_{\sigma,\omega}))\,(\text{run}^{\sigma,\omega}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\,[(\rho_{\text{-PL}}\,(\{\text{dogs}\}\,(\{X \subseteq E | A \subseteq X \wedge \# A \geq 2\}))\,(\text{run}^{\sigma,\omega}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\,[(\{X \subseteq E \mid \{\text{dogs}\} \subseteq X \wedge \#\{\text{dogs}\} \geq 2\})\,(\{x|x \text{ runs}\})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow 1 \text{ iff } \{\text{dogs}\} \subseteq \{x|x \text{ runs}\} \wedge \#\{\text{dogs}\} \geq 2$

b.



$$
\begin{aligned}
[\![S]\!] &\rightarrow \sigma \rightarrow (\omega \mapsto K\ [(\mathrm{NP}\ {}^{\sigma}_{\sigma,\omega})\ (\mathrm{VP}\ {}^{\sigma}_{\sigma,\omega})]) \\
&\rightarrow \sigma \rightarrow (\omega \mapsto K\ [(\rho_{\text{-PL}}\ (\mathrm{N}\ {}^{\sigma}_{\sigma,\omega}\ (\mathrm{PL}\ {}^{\sigma}_{\sigma,\omega}))\ (\mathrm{VP}\ {}^{\sigma}_{\sigma,\omega})]) \\
&\rightarrow \sigma \rightarrow (\omega \mapsto K\ [(\rho_{\text{-PL}}\ (\mathrm{dog}\ {}^{\sigma}_{\sigma,\omega}\ \{\text{-s}_2\}\ {}^{\sigma}_{\sigma,\omega}))\ (\mathrm{run}\ {}^{\sigma}_{\sigma,\omega})]) \\
&\rightarrow \sigma \rightarrow (\omega \mapsto K\ [(\rho_{\text{-PL}}\ (\{\mathrm{dogs}\}\ (\{\ \mathrm{X} \subseteq \mathrm{E} | \mathrm{X} \cap \mathrm{A} \neq \varnothing\ \}))\ (\mathrm{run}\ {}^{\sigma}_{\sigma,\omega})]) \\
&\rightarrow \sigma \rightarrow (\omega \mapsto K\ [(\{\mathrm{X} \subseteq \mathrm{E} | \mathrm{X} \cap \{\mathrm{dogs}\} \neq \varnothing\})\ (\{\mathrm{x} | \mathrm{x\ runs}\})]) \\
&\rightarrow \sigma \rightarrow (\omega \mapsto 1 \text{ iff } \{\mathrm{x} | \mathrm{x\ runs}\} \cap \{\mathrm{dogs}\} \neq \varnothing)
\end{aligned}
$$

We have provided a device to interpret the quantified meaning of bare NPs in themselves. In the same fashion we will show whether bare NPs have an existential or universal reading in Korean and Japanese. Whether they are bare NPs or not, basically all NPs have case markers in Korean and Japanese. Different quantified meanings of bare NPs in Korean and Japanese are dependent upon the case markings of bare NPs.

(13) a. gae nin jitninda. (inu wa hoeru.)
dog NC bark
(Dogs bark.)
b. gae ga jitninda. (inu ga hoeru.)
dog NC bark
(Dogs bark.)

Both of these sentences in (13) contain the same constituents except that the nominative case markers differ. Syntactically the nominative case markers *nin* (or *in*) and *ga*(or *i*) in Korean and *wa* and *ga* in Japanese are the same, but semantically they are different. It is generally assumed that both sentences convey the same reading. In addition, according to Carlson and Lawler both sentences in (13) must convey the same meaning because the predicate *jitninda* (bark) is analyzed to be applied to objects and stages of entities. However, intuitively (13a) has only a universal reading and (13b) has only an existential reading. In ordinary speech when expressing 'to bark' as being a general property of dogs we can use only (13a), and when some dogs bark we can express the situation by using (13b). Therefore, the quantified reading of bare NPs is not determined by the predicate but by the nominative case marker difference.

The fact that the nominative case marker determines the quantified meaning of bare NPs is shown in the following:

(14) a. gae ga apida. (inu ga biyokkida.)
dog NC sick
(Dogs are sick.)
b. ?gae nin apida. (?inu wa biyokkida.)
dog NC sick
(Dogs are sick.)

(15) a. yeoja ga donil beonda. (josei ga ganemougeo sru.)
woman NC money make
(Women make money.)
b. ?yeoja nin donil beonda. (?josei wa ganemougeo sru.)
woman NC money make
(Women make money.)

(16) a. nongbu ga chaesolil gaggunda. (nohu ga yasaio sodaderu.)
farmer NC vegetable raise
(Farmers raise vegetables.)
b. ?nongbu nin chaesolil gaggunda. (nohu wa yasaio sodaderu.)
farmer NC vegetable raise
(Farmers raise vegetables.)

In the examples (14) through (16), because the VPs in the (a) sentences express the temporal feature of the subject and apply to stages of entities, they have an existential reading. Here it must be noted that the subjects in the (a) sentences take the nominative case marker *nin* (or *in*) in Korean and *wa* in Japanese. But the strangeness of the (b) sentences is that while the VPs express the temporal feature of the subject and apply to the stages of entities, the case marker *nin* (or *in*) expressing universality is present. This becomes clearer when the two sentences in each of the following pairs are compared.

(17) a. dongmul in yasaengjeog ida. (tobuss wa yaseidekkida.)
animal NC wild be
(Animals are wild.)
b. ??dongmul i yasaengjeog ida. (??tobuss ga yaseidekkida.)
animal NC wild be
(Animals are wild.)

(18) a. ??dongmul in dallinda. (??tobuss wa hasiru.)
animal NC run
(Animals run.)
b. dongmul i dallinda. (tobuss ga hasiru.)
animal NC run
(Animals run.)

In comparing (17a) and (17b), (17a) is more natural for the universal reading because the VP *be wild* is the property of all kinds of animals and the case marker *nin* is used for universal quantification. On the other hand, the unacceptability of (17b) is that there is a disagreement between the case marker *i*, which triggers an existential quantified meaning of the bare NPs and the

VP *be wild*, which indicates the general or universal property of the subject. In (18) the VP *dallinda* (run) is a property of some kinds of animals but not all kinds of animals. In comparing (18a) and (18b) for the existential reading, (18b) is more natural because the VP *dallinda*(run) is compatible with the case marker *i*, which is used for existential quantification. However, the reason that (18a) is unacceptable is that the case marker *nin*, used for universal quantification and the VP *dallinda* (run), expressing the property of a proper subset of all animals, are used.

As a result, we can draw the following conclusions:

(19) a. bare NP + nin/in or wa = universal reading
b. bare NP + ga/i or ga = existential reading

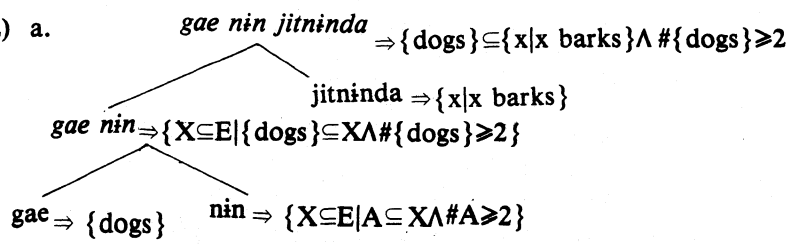
To describe the quantified meaning of bare NPs by way of differing case markers, I extend Cooper grammar as follows:

(20) a. N: dogs, gae (dog), hagsaeng (student)
VP: jitninda (bark), pida (bloom)
CM (case marker): nin/in, ga/i, wa
b. NP → N CM

(21) a. N, VP — If α is listed under N, then $[[\alpha]] = @ \rightarrow f$ such that for any $\omega \in W$, $f(\omega) \subseteq E$
b. CM — If α is i) nin (or in), or wa, ii) ga (or i), or ga then $[[\alpha]] = @ \rightarrow C$ such that for any $\omega \in W$ and $A \subseteq E$
i) $c(w)(A) = \{X \subseteq E | A \subseteq X \wedge \#A \geq 2\}$
ii) $c(w)(A) = \{X \subseteq E | X \cap A \neq \phi\}$
c. $[[N\ CM]_{NP}] \rightarrow \sigma \rightarrow (\omega \rightarrow \rho\text{-}_{CM}(N_{\delta,w}^{\sigma}((M_{\sigma,\omega}^{\sigma}))))$

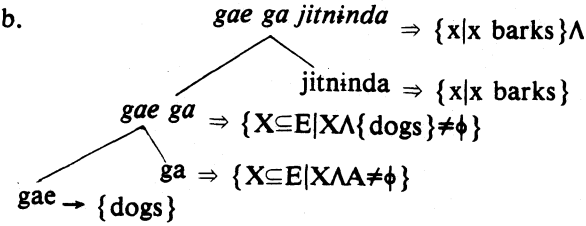
(20) contains the syntactic rules and (21) the semantic rules for bare NPs in Korean and Japanese. (20a) gives the lexical categories, and (20b) is a phrase structure rule which I call the case marker attachment rule. (21a) is a denotation of case markers, and the phrase structure is represented semantically as (21b). According to (20) and (21), the quantified meaning of (13) is as follows:

(22) a.



$[\![s]\!] \rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\mathrm{NP}\ {}^{\sigma}_{\sigma,\omega})\ (\mathrm{VP}\ {}^{\sigma}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\rho_{\text{-CM}}\ (\mathrm{N}\ {}^{\sigma}_{\sigma,\omega}\ (\mathrm{CM}\ {}^{\sigma}_{\sigma,\omega})))(\mathrm{VP}\ {}^{\sigma}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\rho_{\text{-CM}}\ (\mathrm{gae}\ {}^{\sigma}_{\sigma,\omega}\ (\mathrm{nin}\ {}^{\sigma}_{\sigma,\omega}))\ (\mathrm{jitninda}\ {}^{\sigma}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\rho_{\text{-CM}}\ (\{\mathrm{dogs}\}\ (\{\ \mathrm{X} \subseteq \mathrm{E} \mid \mathrm{A} \subseteq \mathrm{X} \wedge \#\mathrm{A} \geq 2\}))\ (\{\mathrm{x} \mid \mathrm{x}$ barks$\})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\{\mathrm{X} \subseteq \mathrm{E} \mid \{\mathrm{dogs}\} \subseteq \mathrm{X} \wedge \#\{\mathrm{dogs}\} \geq 2\})\ (\{\mathrm{x} \mid \mathrm{x}\ \mathrm{barks}\})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow 1$ iff $\{\mathrm{dogs}\} \subseteq \{\mathrm{x} \mid \mathrm{x}$ barks$\} \wedge \#\{\mathrm{dogs}\} \geq 2)$

b.



$[\![s]\!] \rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\mathrm{NP}\ {}^{\sigma}_{\sigma,\omega})\ (\mathrm{VP}\ {}^{\sigma}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\rho_{\text{-CM}}\ (\mathrm{N}\ {}^{\sigma}_{\sigma,\omega}\ (\mathrm{CM}\ {}^{\sigma}_{\sigma,\omega}))\ (\mathrm{VP}\ {}^{\sigma}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\rho_{\text{-CM}}\ (\mathrm{gae}\ {}^{\sigma}_{\sigma,\omega}\ (\mathrm{ga}\ {}^{\sigma}_{\sigma,\omega}))\ (\mathrm{jitninda}\ {}^{\sigma}_{\sigma,\omega})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ [(\rho_{\text{-CM}}\ (\mathrm{dog}\ {}^{\sigma}_{\sigma,\omega}\ \{\mathrm{X} \subseteq \mathrm{E} \mid \mathrm{X} \cap \mathrm{A} \neq \emptyset\}))\ \{\mathrm{x} \mid \mathrm{x}$ barks$\})])$
$\rightarrow \sigma \rightarrow (\omega \rightarrow K\ (\{\mathrm{X} \subseteq \mathrm{E} \mid \mathrm{X} \cap \{\mathrm{dogs}\} \neq \emptyset\})\ (\{\mathrm{x} \mid \mathrm{x}$ barks$\}))$
$\rightarrow \sigma \rightarrow (\omega \rightarrow 1$ iff $\{\mathrm{x} \mid \mathrm{x}$ barks$\} \cap \{\mathrm{dogs}\} \neq \emptyset)$

The reason that (13a) has a universal reading is that the case marker *nin* is used with a bare NP, and the reason that (13b) has an existential reading is that the case marker *ga* is used with a bare NP.

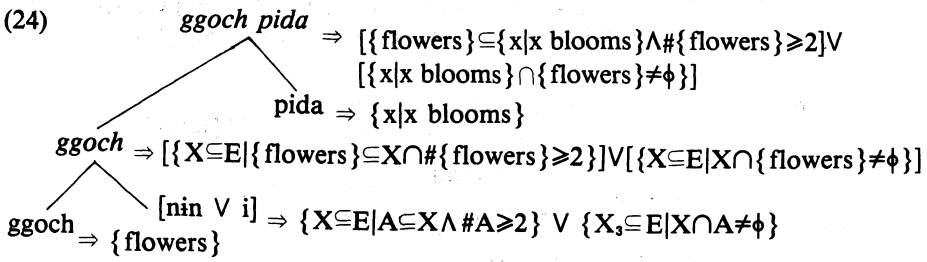
However, bare NPs can be used as subjects without the nominative case marker:

(23) ggoch pi go sae unda. (hana sakki tori nakku.)
flower bloom and bird sing
(Flowers bloom and birds sing.)

This usage usually can be found in couplets or in verse. (23) is composed of two simplex sentences, which have no case markers. The two simplex sentences making up (23) are considered to have their case markers deleted. On occasions a speaker intentionally uses an ambiguous sentence. The reason that (23) is ambiguous is that the different case markers *nin* or *i* can be optionally used. That is, assuming that deletion presupposes recoverability (cf. Chomsky, 1965), the case markers can be recoverable

in subject position in (23). Because the bare NPs *ggoch* (flower) and *sae* (bird) in (23) are not accompanied by case markers, the bare NPs are ambiguous. The ambiguous quantified meaning of the simplex sentence *ggoch pida* out of the compound sentence in (23) is shown in (24):

(24)



Through this discussion I conclude that bare NPs themselves are ambiguous but become transparent with the case marker attachment.

IV. Quantified Meaning of Common Noun Phrase

We have seen that the nominative case marker determines the quantified reading of bare NPs in Korean and Japanese. Similar phenomena can be found in common noun phrases.

(25) a. bujireonhan hagsaeng in sang il batninda. (kinbenna gagsei wa shiyou ugeru.)
diligent student NC prize OC receive
(Diligent students receive prizes.)
b. bujireonhan hagsaeng i sang il batninda. (kinbenna gagsei ga shiyou ugeru.)
diligent students NC prize OC receive
(Diligent students receive prizes.)

The subjects of (25), *bujireonhan hagsaeng* (diligent students), can be analyzed two ways; first, as a subject containing a relative clause (who are diligent); and second, as a common noun phrase subject (diligent students) containing an adjective (diligent). Whether *bujireonhan* (diligent) is derived from a relative clause or is an adjective, the head noun *hagsaeng* (student) is a bare NP. And because the VP *sang il batninda* (receive prizes) expresses a temporal feature of the subject, and applies to stages of entities according to Carlson (1977, 1979), both of the sentences have to have an existential reading. If (25a) has an existential reading the case marker *nin*

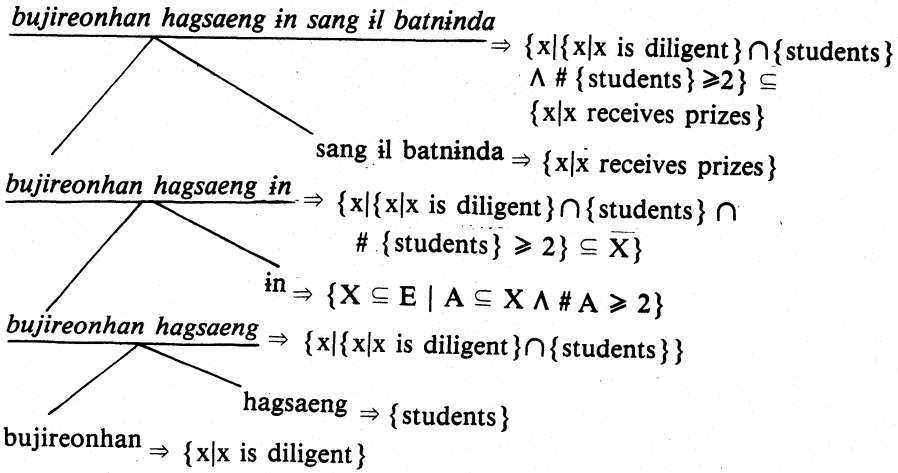
(or *in*) would be inappropriate but the case marker *ga* (or *i*) would be appropriate. On the other hand, if (25b) has a universal reading, the case marker *ga* (or *i*) would be inappropriate but the case marker *n+n* (or *in*) would be appropriate. However, both of the sentences in (25) are grammatical. (25a) has only a universal reading but it is not clear whether the meaning of (25b) is existential or universal. The reason why the meaning of (25b) is not clear intuitively is based on the relation between the modifier and a bare NP. Whether the modifier *bujireonhan* (diligent) is derived from a relative clause or an adjective, the subject in (25) is a bare NP which has no transparent quantifier.

Cooper (1983) distinguishes common noun phrases from full NPs by denoting them differently. The denotation of common noun phrases in defined as the intersection of a set which the common noun denotes and a set which the adjective or relative clause denotes. However, the denotation of full NPs which are modified by adjectives or relative clauses are defined as a set which full NPs denote is a subset of a set which adjectives or relative clauses denote. For instance, the difference between the denotation of bare NP and full NP is as follows:

(26) a. diligent students (or students who are diligent)
$= \{\text{students}\} \wedge \{x|x \text{ is diligent}\}$
b. all students who are diligent
$= \{X \subseteq E|\{\text{students}\} \subseteq \{x|x \text{ is diligent}\}\} \subseteq X\}$

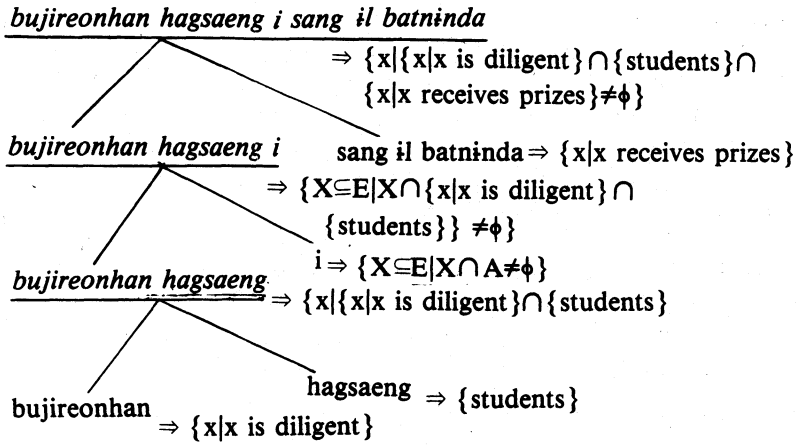
In this case, as in Montague (1974), if the denotation of the bare NP is raised on step to be a set of sets there is no change in meaning. In (25a),

(27)



because the case marker *nin* (or *in*) follows the bare NP, the case marker attachment rule is applied to the bare NP and the result is (27). In (25b), because the case marker *ga*(or *i*) follows the bare NP, the case marker attachment rule is applied to the bare NP, and the result is (28).

(28)



The reason that (25a) has only a universal reading is captured in the logical expression in (27), while the reason that (25b) has an existential reading is found in the logical expression in (28).

V. Quantified Meaning of Subject Complements

We have seen that the case marker triggers the quantified meaning of bare NPs and common noun phrases. However, a complex sentence can have two case markers; one is in the embedded sentence and the other is marked on the subject complement.

(29) a. gae ga jitnin geot in dangyeonhada.
(inu ga hoeru no wa tozenda.)
dog NC bark , that NC . natural-be .
(That dogs bark is natural. *or* It is natural that dogs bark.)
b. gae nin jitnin geot i dangyeonhada.
(inu wa hoeru no ga tozenda.)
dog NC bark that NC natural-be
(That dogs bark is natural. *or* It is natural that dogs bark.)

The subject complement consists of the embedded sentence *gae ga jitnin* (dogs bark), complementizer *goet* (that), and case marker *nin* in (29a). The

embedded sentence itself has the case marker *in* in (29a). The complex sentence in (29b) also has two different case markers; the one is *nin* in the embedded sentence, the other is *i* in the subject complement. The difference between (29a) and (29b) is that the case marker *ga* appears in the embedded sentence and *in* in the matrix sentence in (29a), and vice versa in (29b).

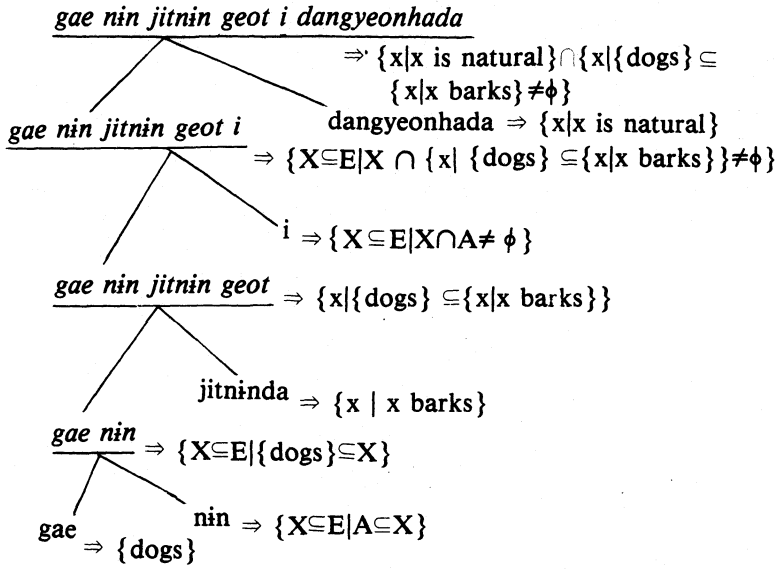
It seems that both sentences in (29) have a universal reading although their case markers are different. If (29a) has a universal reading, my contention that the case marker is a functor expression mapping common nouns to quantified meaning seems to be wrong. Even if the embedded sentence has the case marker *ga* in (29a), the reason that the resultant reading of the whole sentence in (29a) is universal is caused by the functor expression in the subject complement. In other words, the case marker *in* of the matrix sentence has an effect on deciding the quantified meaning of the matrix sentence. On the other hand, the sentence in (29b) seems to have a universal reading because the embedded sentence contains the case marker *nin*.

However, the two sentences in (29) are clearly different in quantified meaning. If the different quantified meanings of the two sentences are distinguished by the difference in case markers, my contention that case markers trigger quantified meanings will be justified. (30a) is a syntactic rule and (30b) is a semantic rule for complements. According to the rules in (30), the meaning of sentence (29a) is (30a), and the meaning of (29b) is (30b) as shown below:

(30) *gae ga jitnin geot in dangyeonhada* $\Rightarrow \{x|\{\text{dogs}\}\cap\{x|x \text{ barks}\}\neq\phi\} \subseteq \{x|x \text{ is natural}\}$

- *gae ga jitnin geot in* $\Rightarrow \{X\subseteq E|\{x|\{\text{dogs}\}\cap\{x|x \text{ barks}\}\neq\phi\}\subseteq X\}$
  - *gae ga jitnin geot* $\Rightarrow \{x|\{\text{dogs}\}\cap\{x|x \text{ barks}\}\neq\phi\}$
    - *gae ga* $\Rightarrow \{X\subseteq E|\{\text{dogs}\}\cap$
      - *gae* $\Rightarrow \{\text{dogs}\}$
      - ga $\Rightarrow \{X\subseteq E|X\cap A\neq\phi\}$
    - jitnin $\Rightarrow \{x \mid x \text{ barks}\}$
  - in $\Rightarrow \{X\subseteq E|A\subseteq X\}$
- dangyeonhada $\Rightarrow \{x|x \text{ is natural}\}$ jintinda

b.



The semantic representation of an embedded sentence should have a truth value because the embedded sentence itself is a complete sentence. However, the denotation of a noun having a complement sentence is a set as in Montague (1974). For instance, the denotation of *gae ga jitnin goet* (that dogs bark) in (29a) is {x|{dogs}∩{x| x barks}≠ϕ}. If the noun that has an embedded sentence concatenates with a case marker, then the structure will be an NP.

The two sentences in (30) have quite different quantified meanings. (30a) has a universal reading even though the embedded sentence of (30a) has an existential reading. When the embedded sentence with a complementizer works as the subject of the matrix sentence, the whole sentence has a universal reading because the case marker *nin* of the complementizer triggers a universal reading. On the other hand, the embedded sentence has a universal reading but when the embedded sentence is used as the subject of the matrix sentence, the subject complement with the case marker *ga* has an existential reading in (30b). That is to say, because a universal reading is presupposed, the sentence in (30b) seems to have a universal reading.

VI. Quantified Meaning of Mass Nouns

Mass nouns have a quantified meaning also, even though they are uncountable. However, it is very difficult to describe the quantified meanings of

mass nouns because they cannot be regarded as descrete individuals. Ter Meulen (1980) provides a way to convert the mass noun into a countable noun. For instance, the mass noun *water* denotes an entity of substance. A count noun is derived from the mass noun by addition of a functional expression, *quantity of,* which denotes a relation between an individual object and a substance. The two terms *water* and *quantity of water* have no difference in meaning but syntactically the former is an uncountable noun or quantities of substances, the latter is a countable noun or individuals. Therefore, the following sentence in (31a) can be translated into the quantified expression in (31b).

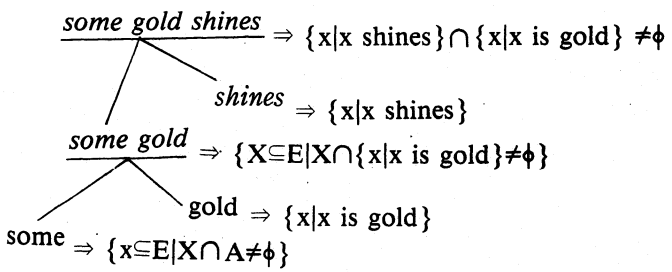
(31) a. All water flows.
b. $(\forall x)$ [(quantity of (λPPw)) $(x) \rightarrow$ flow (x)]
c. $*\forall x$ [water $(x) \rightarrow$ flow (x)]

However, (31c) cannot be a semantic representation of the sentence in (31a), because substance cannot have any amount. On the other hand, amounts are properties of quantities.

It may be possible to represent the quantified meaning of mass noun phrases by way of the λ-expression. But it is not necessary to add the abstract functional expression, *quantity of,* to mass nouns when the notion of generalized quantifier in Barwise and Cooper (1981) is applied to the mass noun to convert the mass noun into a countable noun. As shown in (31b), *quantity of* $(\lambda PPw)(x)$, which represents the amounts of properties of water, can be written as a set-theoretical expression, $\{x|x$ is water$\}$. For instance, the quantified meaning of the sentence in (32a) can be represented as the notation in (31b):

(32) a. Some gold shines

b.



As shown in (32a), the quantified meaning of a mass noun can be described by a set-theoretic notation. In other words, whether it consists

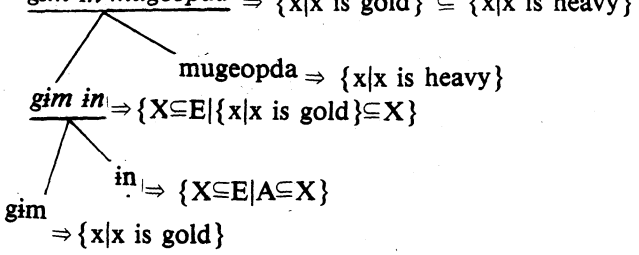
of a mass noun or a countable noun, a bare NP can be treated as indicating individuals by a set expression.

As we described the quantified meaning of countable nouns which are bare NPs, by different case marking in Korean and Japanese, we can also describe that of mass nouns in the same way.

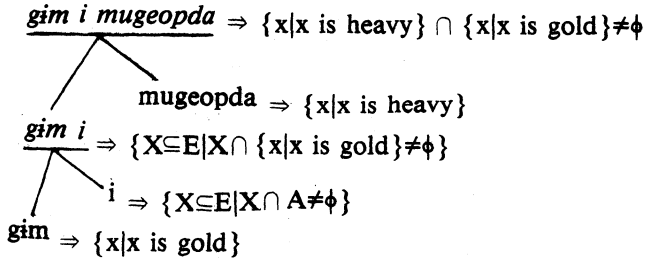
(33) a. gim in mugeopda. (gin wa omoi.)
gold NC heavy
(Gold is heavy.)
b. gim i mugeopda. (gin ga omoi.)
gold NC heavy
(Gold is heavy.)

Intuitively the sentence in (33a) as a universal reading means that the total quantity of gold is heavy; on the other hand the sentence in (33b) as an existential reading means that some quantity of gold is heavy. In other words, the case marker *nin* functions as a universal functor expression and the case marker *i* as an existential functor expression. The quantified meaning of (33a) is shown in (34a), and that of (33b) in (34b):

(34) a.



b.



VII. Conclusion

Bare NPs, which have no transparent quantifier, have ambiguous readings. Syntactically bare NPs in English consist of a common noun plus a plural morpheme {-s}; in Korean they consist of a common noun plus a case marker. Semantically, the quantified meaning of bare NPs is represented by the morpheme {-s} in English, and that of NPs by the case markers in Korean. We regard especially the morpheme {-s} as consisting of the homonyms $\{-s_1\}$ and $\{-s_2\}$. The former is considered to function as a universal quantifier and the latter as an existential quantifier in English. On the other hand, the case marker *nin* (or *in*) is considered to function as a universal quantifier and the case marker *ga* (or *i*) as an existential quantifier in Korean. These of the functional expressions such as the morpheme $\{-s_1\}$ and $\{-s_2\}$ and case marker *nin* (or *in*) and *ga* (or *i*) are applied to the description of quantified meaning of mass nouns as well as complements and common noun phrases.

As we described the quantified meaning of bare NPs by functional expressions, we can retain the principle of compositionality in the description of quantified meaning, and also some problems which were raised in Carlson's and Lawler's analyses can be explained.

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